

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:  
Ravi Iyer

Serial No.: 09/059,865

Filed: April 14, 1998

For: PLANARIZATION USING PLASMA  
OXIDIZED AMORPHOUS SILICON



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Group Art Unit: 2813

Examiner: Nguyen, T.

Atty Docket: MICS:0015--2/FLE  
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JWmo

Assistant Commissioner  
for Patents  
Washington, D.C. 20231

CERTIFICATE OF MAILING 37 C.F.R. 1.8	
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Sir:

**REPLY BRIEF PURSUANT TO 37 C.F.R. § 1.193**

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This Reply Brief is filed in response to the Examiner's Answer, which was mailed on April 12, 2000.

Paragraphs 1, 2, 3, 4, 6, 8, and 9 appear to warrant no further discussion. Paragraph 10 includes the Examiner's grounds of rejections, which were set forth in prior Office action, Paper No. 12.

In paragraph 5, the Examiner contends that the summary of the invention in Appellant's brief is incorrect because the term "undesirable residue" is not disclosed in

Examiner had Reviewed the Reply Brief. TN 6/30/00

the original specification. In reply, the following summary of the invention, which does not specifically include the term “undesirable,” is offered:

Referring to Fig. 6, many semiconductor processes involve the deposition of a blanket layer 602, such as silicon, over protruding device features 601. Page 13, lines 20-22. As illustrated in Fig. 7, the layer 602 is patterned and etched to clear areas where the layer 602 is not needed -- to expose source or drain regions on either side of a gate electrode, for instance. Page 13, lines 22-29. This removal process often leaves residue, typically referred to as “stringers,” that is difficult to remove without damaging the adjacent structures. Page 13, line 29, to page 14, line 2. However, if this material is non-dielectric in nature, it may cause gate leakage. Page 14, lines 16-19. Therefore, rather than risk damaging the adjacent structures by attempting to remove these stringers, Appellant instead oxidizes or nitridizes the not needed non-dielectric stringers to form innocuous dielectric material that need not be removed. Page 14, lines 3-21; Fig. 8.

Appellant submits that the underlined language was disclosed in the original specification, and that one skilled in the art of semiconductor processing would readily recognize that the specification clearly describes *undesirable* characteristics possessed by non-dielectric stringers. Accordingly, Appellant’s submission of the substitute language should not be construed as a concession to the Examiner’s position that the original specification does not disclose stringers as being undesirable.

In paragraph 7, the Examiner states that claims 12-17 and 18-23 should stand or fall together because Appellant failed to provide reasons for claims 12 and 18 standing or falling separately. In reply, Appellant maintains the position that claims 12-17 and 18-23 should stand or fall separately. In particular, independent claims 12 and 18 each recite different terms. The ultimate resolution of the issues concerning these different terms should be based on separate and independent analyses. More specifically, one of the

issues with respect to independent claim 12 is whether the recited term “stringer” is the same, equivalent, or interchangeable with the term “spacer” as disclosed in the Kim reference. This issue is different than one of the issues involved with independent claim 18, in which one of the questions of allowability revolves around whether the term “undesirable residual” is supported by the original specification. These two issues are argued separately, and the resolution of each of the issues will affect only the allowability of the claims in which the terms are recited. Thus, in view of the manner in which the Examiner formed the rejections, independent claims 12 and 18 will stand or fall separately. Dependent claims 13-17 will stand or fall with independent claim 12. Similarly, dependent claims 19-23 will stand or fall with independent claim 18.

Paragraph 11 of the Examiner’s Answer sets forth the Examiner’s response to Appellant’s arguments. First, the Examiner has maintained the rejection of claims 18-23 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification. In particular, the Examiner insists that the term “undesirable” (which modifies the element “residual non-dielectric material”) is not fully and clearly disclosed in the specification. Indeed, the Examiner appears to believe that “the polysilicon stringer as disclosed in the specification can be interpreted as a *desirable* feature.” (Emphasis added.)

Appellant notes that claim language must be interpreted in light of the specification. As the Appellant pointed out in the Appeal Brief, the specification clearly discloses that the residual non-dielectric material left in the creases is “not needed,” yet it

is difficult to remove without damaging adjacent structures. If not removed, the presence of the residual, non-dielectric material may cause gate leakage. Specification, page 13, line 29 - page 14, line 2 & page 14, lines 16-19. In the process which is disclosed and claimed, the detrimental effects caused by the residual non-dielectric material is overcome. That is, instead of removing the residual non-dielectric material and risking damage to other structures, the undesirable residual non-dielectric material is converted into a dielectric material. Because the resultant material is a dielectric, gate leakage may be avoided. Accordingly, the residual non-dielectric material is inherently undesirable up to the point at which it is converted into a dielectric material; only then does the residual material lose its undesirability.

Appellant also points to the contradictory logic of the Examiner's position. The Examiner believes that the residual non-dielectric material (i.e., polysilicon stringers) could be construed as desirable because the polysilicon stringer "will become a thicker insulating layer . . . *after oxidation*." (Emphasis added.) Rather than opposing Appellant, the Examiner's own statement provides support for Appellant's position. That is, claim 18 recites that the residual *non-dielectric* material is undesirable, an inherent property of the non-dielectric material (i.e., polysilicon stringer) which is clearly discussed in the specification. It is not until *after* the residual non-dielectric material is converted into a *dielectric* material that it could possibly become something other than undesirable. Even the Examiner recognizes that desirability cannot occur until something is done to change the undesirability of the residual material (e.g., either by removing it completely or neutralizing it, such as by oxidation). This process of converting an undesirable residual

non-dielectric material to something else (i.e., a dielectric material) is precisely what is recited in claim 18.

In view of the above, Appellant submits that the rejection of claims 18-23 under 35 U.S.C. § 112, first paragraph, because of the term “undesirable” should be withdrawn.

Second, in paragraph 11B, the Examiner responds to Appellant’s arguments with respect to the rejection of claims 12-23 under 35 U.S.C. § 103(a) as being unpatentable over the Kim reference in view of the Matsuoka reference. The Examiner bases this rejection on the contention that the term “stringer” recited in claim 12 is equivalent to the term “spacer” as disclosed in the Kim reference. Appellant disagrees with the Examiner’s position.

The specification sets forth a clear definition of the term “stringer,” which the Examiner apparently and repeatedly has ignored. In particular, the specification defines “stringers” as “a residue” that is left over after an etching process and which “are difficult to remove without damaging the structure or topology of protruding features . . . . In the specific example of a gate electrode with polysilicon stringers, the stringer 701 causes gate leakage . . . .” Specification, page 13, line 29 - page 14, line 2 & lines 16-19.

Appellant submits that this clear definition and description of the term “stringer” is at odds with the description of “spacers” set forth in the Kim reference. That is, the “spacers” disclosed in the Kim reference are formed by an anisotropic etching process,

which is a process that removes the poly or amorphous silicon layer substantially in one direction only, thus purposefully leaving behind sidewall spacers which perform the intended function of reducing the size of the contact hole. Accordingly, the spacers disclosed in the Kim reference, even in their non-dielectric form, are structures which are purposefully created to serve a specific and beneficial purpose. On the other hand, “stringers,” as discussed and defined in the specification, are undesirable residues of material intended to be *removed* by an etching process. Stringers serve no beneficial purpose and, indeed, are detrimental. Thus, stringers are neutralized by converting the stringers into something else, e.g., a non-dielectric material.

It is submitted, therefore, that the recited term “stringer” as construed in light of the specification and the term “spacer” as disclosed in the Kim reference are two wholly unrelated features. Although both features may include a non-dielectric material and result from an etching process, the properties of stringers and spacers are diametrically opposed. As well known to one of ordinary skill in the art, a “stringer” is an unintentional, unwanted leftover having no specific function. A stringer causes gate leakage, is difficult to remove, and, therefore, must be neutralized. A “spacer”, as disclosed in the Kim reference, is purposefully formed to serve a specific function--reducing the size of a contact hole.

It is submitted, therefore, that a “stringer”, as that term should be construed in light of the specification, is not the same as, equivalent to, or interchangeable with the “spacer” disclosed in the Kim reference.

Appellant further notes that Appellant is not attempting to rely on limitations not recited in claim 12 or reading limitations into the claim. Rather, Appellant, by right, is relying on the definition of “stringer” as disclosed in the specification and as known to one of ordinary skill in the art, which includes all of the associated properties and characteristics (e.g., undesirability) of such a feature.

With the respect to the rejection of claims 18-23 under 35 U.S.C. § 103(a) as being unpatentable over the Kim reference in view of the Matsuoka reference, the Examiner’s only basis for the rejection is that the term “undesirable” is not disclosed in the original specification. The Examiner’s argument must fail because of the reasons stated above with respect to the rejection of claims 18-23 under 35 U.S.C. § 112, first paragraph. Further, it is also clear from the above discussion that the “spacers” disclosed in the Kim reference are not “undesirable” residuals, because the spacers are purposefully created to provide a specific function.

With respect to the Matsuoka reference, Appellant maintains the position that the Matsuoka reference does nothing to cure the deficiencies of the Kim reference, which have been highlighted above.

For the reasons expressed above, it is believed that the rejection of claims 18-23 under 35 U.S.C. § 112, first paragraph and the rejection of claims 12-23 under 35 U.S.C. § 103(a) should be withdrawn.



Finally, in paragraph 11C, the Examiner states that Appellant has failed to “timely” file a Terminal Disclaimer during the prosecution of the application to overcome the nonstatutory double patenting rejection of claims 12-23 in view of U.S. Patent No. 5,872,052. The Examiner has cited and apparently relied on 37 C.F.R. § 1.130(b) in support of the Examiner’s position. Appellant notes, however, that § 1.130(b) does not set forth a requirement that a Terminal Disclaimer must be “timely” filed during prosecution, as alleged by the Examiner. Further, Appellant is unaware of any other provision which sets forth such a requirement. Thus, to avoid the time and expense associated with preparing and filing a Terminal Disclaimer, Appellant repeatedly has stated that a Terminal Disclaimer will be provided upon indication of the allowability of the subject matter of claims 12-23.

Respectfully submitted,

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